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The Journal of Parapsychology

A QUARTERLY DEALING WITH TELEPATHY, CLAIRVOYANCE, AND OTHER PARAPSYCHOLOGICAL PROBLEMS

The Journal is published quarterly. Contributions submitted for publication and all editorial communications should be addressed to Gardner Murphy, College of the City of New York, or to Bernard F. Riess, Hunter College, New York City. Correspondence with the editors is advised before submitting articles other than reports of experimentation. Since the Journal does not forward manuscripts by registered mail, it cannot guarantee that they will not be lost in transit, and contributors are urged to keep copies of their papers. All contributions should be typewritten, double spaced. References should be given in the form adopted by the Journal.

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The Board of Review of the Journal currently includes the following: Drs. Saul B. Sells, Louis Long, Irving Lorge, Lillian Dick, H. E. Hilleboe, J. L. Kennedy, and R. R. Willoughby.

The editors have asked Drs. H. Hotelling and J. A. Greenwood to serve as mathematical consultants in especially difficult quantitative problems where mathematics rather than experimental psychology are chiefly involved.

It is through the generosity of these anonymous contributors that the Journal will be enabled to appear in 1941 as a quarterly.

A COMPARISON OF FIVE ESP TEST PROCEDURES[1]

Betty M. Humphrey and J. G. Pratt

ABSTRACT: As the first step in a project to investigate whether ESP results show any relation to personality test scores, 37 college students were given 2,001 runs in five widely varying ESP procedures. Only the results of the ESP tests are reported here. The pooled results of these procedures gave a marginally significant critical ratio of 2.47, while a chi-square method of combining the CR's of all procedures gave a probability of .0045. The results from one matching procedure using enclosed cards dropped through chutes gave the large deviation of -165 in 490 runs. With a standard deviation of 44.27, this gave a CR of 3.73 with a corrected probability of .001. The experiment appears to warrant the conclusion that ESP is evidenced in the results. The suggestion is offered that the significant negative deviation and the chance results of the four other procedures are attributable to the highly routinized experimental conditions which, although regarded as necessary in order to facilitate correlation studies, were recognizably unfavorable to the spontaneous appearance of ESP in the normal form of a positive deviation.

I. Introduction

The research of which this is an introductory report was undertaken to discover any relations that might be found in the correlation of the performance of subjects on a battery of ESP tests on the one hand, and certain personality measurements on the other. Obviously, such a study has at least two distinct parts, each concerned with two basic questions: (1) Do the subjects show ESP ability; and (2) If so, how is it correlated with their personality test scores?

1. The writers wish to acknowledge their indebtedness to Dr. J. B. Rhine for his many helpful suggestions and criticisms regarding both the conduct of the experiment itself and preparation of the report; and to Dr. L. E. Rhine and Dr. C. E. Stuart for careful readings of the paper at various stages in its development.

Since each of these questions has its own history and methodology the two sections of the research can most conveniently be handled in separate reports. The present article deals solely with the results of the ESP tests. A later paper will report and discuss the ESP and personality correlations of this and other investigations of similar character.

In planning the ESP phase of the research, the objective was to obtain a broadly representative set of ESP procedures. The five which were chosen consequently vary widely in type. One of these represents what is known as "general ESP" which potentially allowed both telepathy and clairvoyance to take place. Another involved the precognition hypothesis (pre-shuffle card-calling). A third utilized the matching method known as "blind matching" in which ESP cards were matched face downward against concealed key symbols. A fourth test, also matching but with exposed key symbols, required the use of cards individually enclosed in sealed opaque envelopes. The fifth test involved the use of a newly constructed machine in which the sorting of colored marbles was the essential procedure.

This selection of procedures afforded, it was hoped, a sufficient variety of conditions to bring out individual differences and preferences on the part of the subjects, if there were any. The GESP test was intended to appeal to those subjects who felt a need for a sender or personal agent with whom telepathic contact might be effected in the test. It is likely to seem most "reasonable" to the beginning subject.

On the other hand, the precognition test is likely to appear to the average naive subject as an almost impossible task. At the same time, it appeals to some subjects as the most challenging, perhaps because of the very incredibility of the hypothesis of precognition.

The blind matching procedure gives the feeling of more active participation since the subject has an opportunity to handle the cards which are used in the test. Most of the experimental work in recent years has been done with card matching tests and they have been both popular and effective.

The open matching method with the sealed cards represents a combination of special virtues. Open matching has been more popular and more successful than blind matching but, for complete security against occurrence of errors, some concealment of the cards is necessary lest they afford cues to the subject. Accordingly, the enclosure of the individual cards in sealed opaque

envelopes was added as a precaution. There has been, however, a peculiar reaction in some instances to the enclosure of cards and this feature itself therefore possessed added interest.

Finally, the introduction of the marble test machine represented an interest in the use of mechanical apparatus in the ESP test. That machines as testing devices have been successful has been amply demonstrated by Tyrrell (15), but they have not had general application. The particular machine used had had no previous tryout and represented an unknown quantity insofar as expectations went. In its preliminary trials, it was observed to arouse considerable subject interest.

A detailed description of these methods will be found below with the results of each stated individually as well as in combination. Those readers who are interested only in the statistically significant sections of the report will perhaps wish to have the information at this point that, of the five procedures used, only that with the open matching of enclosed cards met the extra-chance criterion, although the results of all five in combination may be regarded as marginally significant. It seems worthwhile, nevertheless, to give a full description of the experiment in order to permit comparisons and to make possible repetitions of the work, in whole or in part.

In order to afford a uniform basis for comparison of ESP test results with those of the personality tests, it was planned to give each subject a given number of runs with each test procedure as nearly as could be done. This sort of routinized procedure is recognized by the experienced student of ESP as destructive of an essential spontaneity or freshness of interest on the part of the subject, since it tends rather to create a "task atmosphere" and to fix a weight of responsibility upon the subject in his participation. In spite of this aspect, the decision was made in favor of regularity of appointments and a fixed quota of runs per subject. This plan seemed necessary, on the basis of previous experience, in order to insure the obtaining of data most suitable for making the ESP-personality correlations. In the present research, with five procedures on which comparisons were to be made, the many disturbing factors (such as loss of interest, the caprice of the subject, and the like) would otherwise have rendered statistical treatment exceedingly precarious. It was recognized that the experiment was initiated with a handicap due to the element of regimentation of the subject which the design of the research seemed to require, but it is evident that the experimenters had hopes of overcoming this handicap

or they would not have undertaken the project in its present form. In this connection, the earlier work of Rhine (10: p. 285) might be mentioned in which the observation was made that regular appointments with routinized experimental sessions led to much lower scoring than did the testing of subjects in more spontaneous situations.

II. General Experimental Conditions

In setting up the conditions for the different tests, it was the aim of the experimenters to reduce to a minimum all possibilities of error. A full statement of the plan of the experiment (purpose, description of techniques, manner of choosing subjects, length of series, and methods to insure completely independent recording and computations) was written before starting the testing itself. The steps set forth in this preliminary statement were followed closely throughout the experiment.

Numbered record sheets were used for each technique and all records were accounted for at the end of the experiment--thus guarding against selection of data. All records of scores were kept in triplicate: in addition to the original record sheets, each experimenter kept a personal record book of the results by subjects.

Subjects were undergraduates at Duke who volunteered for the experiment. No effort was made to select them on any basis other than that of their willingness to participate. Each subject, when volunteering, indicated his free hours. From this schedule, the experimenters notified each subject of weekly or semi-weekly appointments. A total of 37 subjects were tested. Twelve of these, however, were unable to continue the tests after the first session (because of lack of either time or interest). Their results are included for the sake of completeness, but in the main the results of the experiment consist of the work of 25 students who were able to complete tests in more than one technique.

Although no extensive system of rewards was connected with the experiment and no attempt was being made to note the effect of rewards, the subjects were offered movie tickets for scores of nine or over.

No rigid order of giving the different tests was adhered to, but subjects generally took the tests in the following order: GESP, OM Chutes, BM Table, ESP Marbles, and Precognition. This order was often changed to suit the needs of the occasion. Also, a subject was not required to complete twenty runs in one technique before

trying another. In actual practice, the OM Chute test came first for many subjects, and it was almost always the first procedure finished by a subject. Even when a subject started on GESP on his first visit, the quota of twenty runs was never completed on that occasion. On the second visit, the rule was to go on to OM Chutes, a test in which the quota was easily filled in a single session.

It was planned to have each subject complete twenty runs in each technique, but lack of time on the subjects' part and the ending of the school year made this impossible in many instances. The preliminary statement of the plan of the experiment provided that if testing were stopped by the end of the school term the work would be considered as complete with the amount done.

III. The Five ESP Procedures

A. GESP. In this set-up the sender was located in the large recreation room on the top floor of the building with windows opening only on the west. The subject was in an experimental room on the same floor with the window opening to the south. The two rooms were 50 feet apart along the corridor, and during the experiment the sender and the receiver had three closed doors and two solid brick walls between them.

ESP cards were used in this test in packs of 50 cards each. They were prepared in advance by J.G.P. in the following manner: First they were given five dovetail shuffles and at least one cut. They were then recorded, with a carbon duplicate, on serially-numbered record sheets in pads clearly marked for this experiment. After each deck had been recorded, it was fastened with a rubber band and placed in a small box. The carbon record was then torn out of the pad, folded, and put in a black envelope. The card box and the envelope were bound together by a rubber band, and to these was attached a strip of paper with the correct serial number. The decks as thus prepared were then placed in a locked box in the correct order for use. Only the experimenters held keys to this box.

Each subject, when making his appointment for the GESP test, was asked to bring a friend to act as sender. If he was not able to do this, one of the experimenters (with few exceptions, B.M.H.) acted as sender. At the time of the first testing session for each subject, B.M.H. instructed the subject and the sender as to their roles in the experiment. The sender was shown the one-way signal light in the recreation room and was told that he was

to hold the deck of cards, as it came from the box, face down in his hands as though prepared to deal and to place the first card from the deck face up on the table as soon as he was ready, without waiting for the light to flash. When the flash did occur, he was to concentrate on this first card. When the light went off (a sign that the subject was recording his call for the first card), the sender was then to place the second card face up on the first one, and so on without interruption through the entire pack of fifty cards.

The receiver was shown the second experimental room with the signal button and the record pad, with serially-numbered sheets in duplicate, on which to record his calls. He was asked to use one hand for both operating the signal button and writing his calls, so as to eliminate the possibility of confusion. The receiver was told that when he was ready, he was to press the button as the signal for the sender to concentrate; then when he had formed his impression of a symbol, he was to remove his hand from the signal button and record his choice, then to press the button again for the second card, and so on for the whole run.

After giving these instructions and after seeing that the receiver was in his place, B.M.H. closed the doors, handed the sender the cards (still in the box), and then left the room. The experimenter retained the black envelope with the carbon copy of the card order. The doors between the experimental rooms remained closed during each run; the experimenter was careful to stay in a position between the doors to see that this was the case.

At the end of the run the receiver signed his name and then deposited the original record of his calls in a locked box before B.M.H. and the sender entered his room for the check-up. The score for the run was then checked from the subject's carbon record of calls and the carbon record of cards taken from the envelope. B.M.H. retained these two carbons as her personal record of the results. A testing session continued for as many runs as the experimenter deemed wise or as time permitted.

J.G.P. later removed from the locked box the call records and checked them against his original records of the cards. These records he kept for personal reference. The two experimenters then compared results and any discrepancies were removed by consulting the records of both experimenters.

B. OM Chutes. This procedure was devised for this experiment by B.M.H. The aim of the set-up was to

enable the subject to escape from any feeling of self-consciousness or restraint which he might happen to feel in the presence of an experimenter; yet to retain the most rigid experimental controls. Also it was thought that the disappearance of each card from view after it had been matched would help the subject to escape from the patterning tendencies often so strong in matching tests.

In preparation for this experiment twenty decks of cards were placed, each card individually, in black opaque envelopes and sealed with heavy gummed paper. A code number was placed on the outside of each envelope. The code itself was made up by shuffling thoroughly a deck of cards numbered 1-25 and arbitrarily putting the first five numbers to appear on top of the shuffled deck on envelopes containing squares; the next five numbers on circles; then stars, waves, and crosses for succeeding fives in order. These numbers, together with the letters of the alphabet used to differentiate each deck were written in India ink on the envelopes enclosing the cards. The process of selecting the card order was repeated for each of the twenty decks, thus providing a thoroughly unique code for each sealed deck. No subject had any knowledge of the manner in which the codes were made up, and, since the copies of the codes were kept in the experimenters' possession at all times, no one had an opportunity to learn them.

The subject was shown a set-up with five key-cards visible before him and before each key-card an opening (see Fig. 1). He was given twenty decks of ESP cards, with each card sealed in an opaque envelope, and was told that he was to try to match the symbol in each envelope with one of the key-cards by dropping it in the proper opening. The cards then passed through the chutes into a compartment box in the next room.

During an experimental session both experimenters were present in the room where the cards fell into the box with five open compartments. As the subject finished one run, the box was removed and an empty one put in its place in readiness for the next run. While the subject did the next run, the two experimenters together silently counted the score of the one just completed. The steps in doing this were: (1) The box was laid on its side with the opening toward the experimenters. The number of cards in each compartment was observed and recorded in order to remove the danger of any cards being misplaced without detection. (2) A strip of cardboard the length of the compartment box with the code for the particular deck used was placed directly on top of the box. The code for the key symbol for each compartment was thus

directly adjacent to that compartment. With both experimenters observing, the cards were removed from the first compartment and compared with the code. The incorrect cards were put back in the compartment immediately; the correct ones were laid at its front edge. B.M.H. recorded the number correct in each compartment as the count was made. When this had been completed for all five compartments, each experimenter counted the hits and recorded the score for the run.

Each subject used a pack only once. Thus the remotely conceivable possibility of auditory cues given by the experimenters during the checking could have had no bearing on the results.

The cards as distributed by the subject were left in the compartment boxes after the session until an assistant (D.H.C., Laboratory secretary) had recorded them on the numbered record sheets preassigned to the runs. The assistant then independently re-checked the scores. Comparison of these scores with those of the experimenters was made and in case of a discrepancy, the score nearer chance (on the side of safety) was counted.

C. Blind Matching Table. This apparatus was a new device designed for "blind-matching" tests. Each subject was instructed to distribute a pack of ESP cards in front of five openings or small windows in the table top so as to match five concealed ESP symbols stamped on a roll of paper inside the table. After the cards were all matched the experimenter (usually J.G.P.) recorded the subject's choices on the blank section of the roll showing through the openings. Someone then pulled the lever which carried the written record out of sight and brought into view the key symbols. The score was counted and written down by the experimenter in his own personal record book.

The roll was later checked by an assistant and the scores compared with those of the experimenter. In case of a discrepancy, the roll was rechecked by two observers and any corrections were made from the roll record. The fact that the roll moved only in one direction eliminated the possibility of the subject's revising his call record after having seen the key arrangement. The table had a lock which prevented its being opened by anyone other than the experimenters.

In making up the roll of key symbols the following procedure was used. The throw of a die determined the choice of a column from a table of all possible permutations of the five ESP symbols arranged in five columns and twenty-four rows. (The throw of a six was

disregarded.) Another die throw determined the choice of a card from a shuffled deck numbered from one to twenty-four. (The use of a single die restricted the range of the cut to the top six cards, but a random distribution of the numbers selected was achieved by shuffling and cutting the deck before each die throw. The number on this card determined which combination of key symbols was to be selected from the column. The order of symbols thus chosen was then stamped on the roll in indelible ink. This procedure was repeated for each group of key symbols until the roll was filled.

The Laboratory secretary D.H.C. and experimenter B.M.H. worked together making up each roll, the former following the procedure for choosing the symbol order, the latter stamping the roll accordingly. The preparation of a roll was carried out under conditions such that no subject ever saw the stamping of a roll nor a partially stamped roll. All stamped rolls not in use were kept in locked compartments.

D. ESP Marbles. This test was conducted with a machine designed by J.G.P. with the aid of Mr. Wallace Scherer of this Laboratory who constructed it. Since this is the first report of tests made with this apparatus, a detailed description of the machine would normally be in order. However, since the results were not significant and since redesigning is intended, it will not be described here in complete detail. It will suffice to say that the subject guessed the color of a marble just ready to roll into sight by pushing one of five colored levers. Hits could be counted during the run or at the end by observing how many marbles were of the same color as the channels in which they lay.

Each loading of the machine provided for ten runs or 250 trials. The 250 marbles with which the machine was loaded were taken from a stock of 1,000, 200 of each color, which had been well mixed. The 1,000 marbles were kept locked in a desk at all times except when the machine was being loaded. The machine was always loaded by one of the experimenters or by some member of the laboratory staff. The person to load the machine was not allowed to be present with the subject during a test.

At the time of the experiment, either J.G.P. or B.M.H. (the one who had not loaded the apparatus) was always present to explain the operation of the machine and to keep a record of the run scores. After the machine had been emptied, the other experimenter and an assistant (D.H.C.) unlocked the machine and removed a drawer from the bottom. This drawer contained the marbles still separated into the five color compartments. These two

observers independently counted and recorded the number of marbles of each color in each compartment. By totaling the proper figures, they thus arrived at an independent check upon the number of hits scored in the entire ten runs.

E. Precognition Test. The record sheets used in this experiment provided for ten runs each. At the beginning of the experimental session, the subject was given the record sheet or sheets. (At the discretion of the experimenter the subject was asked to do either ten or twenty runs at one session.) He was instructed to predict in each space of the call columns the order of symbols which would correspond to the order later to be written into a corresponding card column. In short, the subject was to predict the order of ESP cards as they would be after being shuffled later. The subject was then left alone to complete his task. Upon finishing, the subject sealed his call records in a specially provided black envelope and brought it to the experimenters. He could then either wait until the results were determined, or could be notified of his scores later.

Upon receipt of the sealed envelope, the two experimenters determined the order of cards to be matched with the subject's calls. The first step in getting the card order for each run was for each experimenter to shuffle thoroughly a deck of cards: B.M.H. a pack of 25 ESP cards, and J.G.P. a pack of plain cards numbered from 1 to 25. A random cut of the ESP deck was then determined in the following manner. Three eight-sided dice, the sides numbered from one to eight, were used. One was red, one white, and one blue. The three were thrown together; the numbers on the top face of the two colored dice were multiplied; and the number on the white die added to this figure. If the number thus obtained was less than 25, that card from the top of the numbered deck was taken and the number on it gave the place to cut the ESP pack. In case the number obtained from the dice throw was more than 25, 25 or a multiple of it was subtracted and the resulting number was used to determine the cut of the numbered deck. (The use of the interposed cut of a shuffled numbered pack made it equally likely that the cut would come at any position of the ESP pack.) After the order of cards had been found in this manner, the record of the 25 symbols was made in the card column of a record sheet which bore the same serial number as the sheet for calls which the subject had filled in and sealed in the envelope. This was done for the same number of packs as the subject had recorded calls.

After the card record was completed, the experimenters opened the subject's record. Each experimenter

counted the hits independently and then compared results. Any discrepancies in the two sets of scores were corrected by consulting the record sheets again.

IV. Results

General. The 37 subjects who participated in the experiment completed a total of 2,001 runs, or 50,025 trials. In this number of trials there were 9,784 correct hits made, which is 221 less than the number expected by chance. The critical ratio obtained from this deviation is 2.47, which is just below the 2.5 level of significance. (The probability of finding a deviation *in either direction* from the mean as great as 221 hits in 2,001 chance runs is .0136.)

The main interest, however, lies in the distribution of the deviation over the five subdivisions contributing to the totals just given. Since the main objective of the research lay in the comparison of procedures, it is important to preserve whatever distinctive effect any given procedure may show rather than to pool the results of all procedures into a common total where they may cancel each other out. It is necessary, then, to use a method of evaluation of the probability of this result which allows for any peculiarity of distribution among the different series. The chi-square method of combination of critical ratios is well adapted to the purpose; and by the use of this method, a total chi-square of 17.0 is obtained which, with five degrees of freedom, is equivalent to a probability of .0045. This may be regarded as significant.

TABLE I

Summary of Results by Procedures

Procedure	Runs	Hits	Dev.	S.D.	C.R.	x^2
GESP Series	382	1,877	-33	±39.09	.84	.71
OM Chutes "	490	2,285	-165	±44.27	3.73	13.91
BM Table "	462	2,287	-23	±42.98	.54	.29
ESP Marbles "	287	1,398	-37	±33.88	1.09	1.19
Precognition "	380	1,937	+37	±38.98	.95	.90
Total	2,001	9,784	-221	±89.46	2.47	$\Sigma x^2 = 17.00$

d.f. = 5
[P = .0045]

TABLE II

Individual Subject Performance in the Five Test Procedures

Subject	GESP			OM Chutes			BM Table			ESP Marbles			PDT		
	Runs	Av. 25	CR	Runs	Av. 25	CR	Runs	Av. 25	CR	Runs	Av. 25	CR	Runs	Av. 25	CR
SB	20	5.35	.78	20	4.40	1.34	20	4.95	.11	20	4.55	1.01	20	4.45	1.23
ST	20	5.30	.67	20	4.90	.22	20	4.90	.22	20	5.15	.34	20	5.00	.00
CL	20	5.10	.22	20	4.85	.34	20	5.45	1.01						
AD	20	5.80	1.79	20	5.05	.11	20	5.45	1.01	20	4.50	1.12	20	4.75	.56
WL	20	4.00	2.24	20	4.50	1.12	20	5.00	00	20	5.65	1.45	20	5.40	.89
CD	18	4.72	.59	20	3.70	2.91	20	4.90	.22	20	4.90	.22	20	4.75	.56
MC	8	4.32	.88	20	5.15	.34	20	4.80	.45						
JF	20	4.95	.11	20	4.10	2.01	20	5.30	.67	20	5.30	.67	20	5.25	.56
FN	20	5.20	.45	20	5.10	.22	20	4.70	.67	20	4.85	.34	20	5.65	1.45
MW	20	5.10	.22	20	5.10	.22	20	5.20	.45	16	3.44	3.13	20	5.40	.89
LR	20	5.05	.11	20	5.30	.67	20	5.05	.11	20	5.55	1.23	20	5.75	1.68
BG	20	4.30	1.51	20	3.65	3.02	20	5.00	00	20	4.65	.78	20	5.25	.56
JU	2	6.00	.71	20	5.20	.45	20	5.40	.89						
VK	12	5.42	.72	20	3.80	2.68	20	4.50	1.12				20	5.30	.67
HT	20	5.40	.89	20	5.10	.22	20	4.80	.45	20	4.95	.11	20	4.60	.89
ES	4	3.50	1.50	20	4.75	.56	20	4.20	1.79	20	5.05	.11	20	4.80	.45
ML				20	5.05	.11	20	5.10	.22	8	3.88	1.59	20	4.90	.22
NM	16	5.25	.50	20	4.10	2.01	20	4.40	1.34	15	4.67	.65	20	4.40	1.34
GM	10	4.00	1.58	20	4.50	1.12	20	5.50	1.12						
BB	20	4.35	1.45	20	4.05	2.13	20	4.60	.89	20	4.70	.67	20	4.80	.45
MM	8	6.00	1.41	20	4.75	.56	14	4.29	1.34				10	6.40	2.22
BGr				20	4.60	.89	8	4.62	.53				10	4.50	.79
PF	18	5.44	.94	10	5.00	00									
PFe	4	3.25	1.75	20	5.00	00	20	5.40	.89				20	5.05	.11
RL	4	4.00	1.00	20	5.05	.11	20	4.90	.22	8	5.75	1.06	20	5.90	2.01
Minor Subj.*	38	4.45	1.70												
Total	382	4.91	.84	490	4.66	3.73	462	4.95	.54	287	4.87	1.09	380	5.10	.95

*Results of tests from minor subjects (those who did 4 runs or less) were obtained in the GESP procedure only. These were as follows:

Subject	Runs	Av. 25	CR
IQ	2	4.00	.71
EK	4	4.00	1.00
JH	4	4.00	1.00
BBa	2	5.00	00
VH	2	3.00	1.42
MU	4	4.00	1.00
GMe	4	4.00	1.00
JM	4	5.50	.50
SO	2	5.50	.35
RK	2	4.00	.71
HS	4	4.50	.50
MCo	4	5.50	.50

Table I presents the results of the individual series for the five procedures, as well as the totals. It will be noted that one of these--the OM Chutes procedure--gave the major portion of the deviation: -165 of the total of -221. In view of this fact, some further detail regarding the data of this test is warranted.

OM Chutes Procedure. The data of this series consist of 490 runs with 2,285 hits. This represents an average of 4.60 hits per run or 165 below expectation. The CR is 3.73, which is equivalent to a P of .0002 that so large a deviation in either direction from the mean would occur as a result of chance factors. Corrected for the selection of one of the five procedures, this probability becomes .001.

The goodness-of-fit test which measures the degree of approximation of the observed score frequency distribution to the binomial expectation gives a chi-square of 21.08 which, with nine degrees of freedom, represents a P of .012. The notable feature of the distribution lies in the consistently higher frequency of scores from 0 to 3 inclusive and the frequency of scores from 6 to 9 inclusive.

Examination of the individual CR's for OM Chutes (see Table II) reveals that the largest critical ratio is 3.02, while two are between 2.50 and 3.00, and three between 2.00 and 2.49. These largest six CR's are all based upon negative deviations. This aspect of the results shows that, while there were large individual differences in results, several subjects contributed effectively to the negative trend of the total result; there was no outstanding individual positive total.

Hit Frequency Distribution in the Run. As a consequence of the finding of Rhine (8) that the DT technique (calling down through the unbroken pack) gave a hit distribution having a U-shaped curve (i.e., showing most hits at the beginning and at the end of the run), attention has been given by many experimenters to the distribution of successes within the run. Pegram (6), Gibson (2), and Clark and Sharp (12) found similar U-shaped curves with the use of the DT procedure. However, MacFarland (4) and Martin and Stribic (5) failed to obtain U-shaped curves. Martin and Stribic report a straight-line decline from the beginning to the end of the run.

Although the only two procedures of the present experiment which were in such form that the results could yield a frequency curve (GESP and Precognition) gave

chance results by the critical ratio method, the writers felt that sufficient interest attaches to such curves to justify recording the results of these tests in this form. More than usual interest in these curves was felt at the present time because of the work of Rhine on terminal salience within ESP runs, the first report of which is found in this issue.

The GESP series was conducted in runs of 50 trials each, but the calls were recorded in two columns of 25 trials each. It is a question as to what would be the proper method of plotting the hit frequency distribution for this series. It seems, however, that for the subject, the record sheet itself, which broke up the run into two sections of 25 trials each, might have been expected to have been more determinative than any other feature; and accordingly, the hit distribution is made out on the basis of 25-trial runs.

The 25-trial run is divided into five sections of five trials each and the hit frequency for each section is determined. This gives a five-point curve of hit frequency for the run. The above-mentioned work (with the exception of Martin and Stribic, who gave a 25-point frequency distribution) followed this plan.

The GESP series gives a declining curve with an up-turn at the end which is suggestive of the U-curve. The Precognition results plotted in the same way give a declining curve. It should be clearly understood that no significance can be attached to these curves in isolation but that they may be worthwhile fragments of evidence in the cumulative study of the distribution of hits within the run. The curve found here in the case of Precognition is reminiscent of the declines reported in the earlier decades of ESP research; e.g., Richet (11), Jephson (3), Estabrooks (1), and the cases of Frick and Linzmayer reported by Rhine (8: pp. 140ff.). Table III shows the data of the GESP and Precognition tests (hits and deviations for each of the five points) upon which the curves are based.

TABLE III

Hit Frequency for Groups of Five Down Through the Run

	1st Five	2nd Five	3rd Five	4th Five	5th Five
PDT	+38 318	+22 402	+15 395	-13 367	-25 355
GESP	+9 391	+2 384	-18 364	-23 359	-3 379

V. Interpretation of Results

Before concluding that extra-sensory perception has been shown to occur in the OM Chutes section of this experiment, it is well to take into account other possible alternative hypotheses besides the chance hypothesis.

The Sensory Hypothesis. In this section, the four procedures which yielded chance results can be passed over, as no further explanation of those results is required. The first question for discussion is: Was the OM Chutes test adequate to eliminate non-chance scoring by any and all methods which might make use of known sensory processes alone? As stated, this question is broad enough to cover all varieties of counter-hypotheses which have been discussed in the literature.[2]

It will suffice to recall the features of the OM Chutes procedure which made it impossible for the subject to use any form of sensory cues. The cards were sealed in opaque black envelopes and wrapped completely around with heavy gummed paper thus making direct visual and tactual perception of the symbols completely impossible. Each deck was marked with a unique code and a subject never used the same deck twice, so it was out of the question that the code markings could have been learned. The codes were determined at random, so there was no system to be detected. The keys to the codes were kept locked in a desk at all times when they were not in use, and the sealed cards were locked in the laboratory at night. Finally, there is evidence from the results themselves that the subjects were not "pulling the wool over the eyes" of the experimenters. The subjects scored below chance when they had been instructed to score high. As they were all naive about ESP work, they did not know that consistent low scoring would be of any scientific interest. Furthermore, they were offered a movie ticket for each score of nine or higher, and they were consequently interested in high scores.

Checking and Computing Errors. Experimenters' errors were avoided by having the double count of the score at the time of the experiment, followed by an independent recording and re-checking of the score by a third person. In case of a discrepancy in these two sets of scores, there was no way to locate the error, but taking the score nearer the chance mean or that on the side of safety is the accepted scientific practice for such cases.

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2. For the fullest discussion of counter-hypotheses in relation to the evidence for ESP, see Rhine et al., *Extra-Sensory Perception After Sixty Years*, Chapters V and VI.

Computing errors were avoided by having each experimenter independently make all of the analyses used from his own records of the results. These were then compared and checked until complete agreement was found.

Sampling and Optional Stopping. All the trials made with the OM Chutes procedure by the subjects who were used in this experiment are included in this report. Serially numbered record sheets in all procedures safeguarded against selection of data or unintentional omissions. Optional stopping as an hypothesis seems to have little applicability in this experiment. The experiment was set up to include from 30 to 40 subjects, with 20 runs in each procedure by each, *or as much, short of this goal, as could be completed by the end of the school year.* As it turned out, the work was brought to an end by the approach of final examinations with the consequent unwillingness of the subjects to take any more time from scholastic duties. The decision to report as a unit the work accomplished by the end of the school year was made when the experiment was first planned.

Conclusion in the Light of Safeguards. The design of the experiment had as a primary objective to reduce the possibilities of interpreting the results to two alternatives: chance or ESP. Re-examination of the design of the OM Chutes indicates that this objective was reached. Inasmuch as the results of that procedure are statistically significant, even when properly combined with the chance results of the four other procedures and when allowance is made for the negative direction of the deviation, the conclusion indicated is that the subjects exercised ESP in that part of the experiment.

VI. Discussion

While the foregoing conclusion that ESP occurred is reached on the basis of clear-cut statistical evaluations of the data, the results themselves present some interesting relationships which raise new problems requiring further research. There are two principal features which call for explanation: first, the fact that four of the five series yielded insignificant results; and second, the fact that the one significant deviation was negative rather than positive. Since this one significant deviation was sufficiently large to make unimportant statistically whether it was positive or negative, the latter problem becomes a purely psychological one.

No certain explanation can be offered for these two peculiarities in the results. Considerable further

investigation may be required to test such hypotheses as may be offered in tentative explanation. But since it is a necessary first step to consider such hypotheses, an effort will be made to present such tentative explanations as the facts of the experiment and the relevant literature on the subject would appear to provide. The writers have had the benefit of lengthy discussion with some of their colleagues of the issues raised by these results, and the aim has been to bring together here all the suggested explanations for these puzzling results that have come to their attention. This discussion may be regarded as a necessary preparation for any further experimentation along these lines. The working hypotheses which are offered appear, from the facts at hand, to define the limits within which the explanations lie. Naturally, nothing about these suggestions is intended to have the force of a conclusion from the data.

The discussion will deal first with the reasons for the difference *in significance* between OM Chutes and the other four tests. But it may help to digress briefly here in the interest of avoiding a logical confusion. The fact that the significant deviation of OM Chutes was *negative* has no bearing on the question whether that test alone may not have been successful in detecting ESP ability. This is clear as long as it is kept in mind that ESP ability, upon which scoring depends, has no sign, either positive or negative; it is either there in some degree, or not present. At a later stage, the discussion will be concerned with the different ways in which a *good* test for detecting ESP may actually produce negative scores.

Insignificant Deviations. The failure of some experimenters to get significant results with a given group of subjects in ESP tests has occasioned much discussion in the course of the history of ESP experiments. For the most part, such discussion has been of speculative character; there has been little following up with a program of experimentation that would reveal the causes of the failure to find reliable deviations. As the recent review by Smith and Gibson (14) shows, there have been many comments by experimenters as to what, in their judgment, constituted favorable or unfavorable conditions for the production of ESP results. The literature contains a number of instances in which explanations have been offered for the production of chance results when extra-chance results were anticipated. To review these explanations here would be unwarranted use of space in view of the fact that none of the explanations in question have been verified experimentally.

During the last three years, however, a start has been made in an experimental attack upon aspects of this problem. MacFarland (4) found important differences in subject performance with different experimenters, as did also Clark and Sharp (12). Pratt and Price (7) found subject-experimenter relationships apparently determinative of success or failure. But neither of these explanations would seem to distinguish between one series giving significant results and four others by the same experimenters giving chance results. For that matter, none of the suggestions found in the literature--even these lacking the status of verification--would seem to fit the requirements of this distinction.

There appear to be two ways in which the result in question--one significant test and four insignificant ones with the same subjects and investigators--might have occurred. One is that something about the experiment in general or about the individual procedures made the OM Chutes alone a test capable of detecting ESP ability (by means of either a positive or a negative deviation). According to this hypothesis, this "something in the situation" blocked the subjects in the exercise of ESP ability in the other four procedures.

The second suggested explanation may be stated as follows: There were factors in the general experimental situation which tended to produce evidence of ESP in the usual form of a positive deviation (i.e., in the direction of the subject's aim). But there were present also in all five procedures contrary factors which tended to produce negative scoring by ESP. These factors operating in all five tests were opposed and about equally effective, so that what would normally have been a positive deviation in all five conditions was reduced to the level of chance expectation. (An additional feature of this hypothesis, relevant to the discussion of the below-chance scoring in one of the tests, is the supposition that some aspect peculiar to the OM Chutes procedure further accentuated the negative scoring tendency in that one procedure to produce the significant negative score.)

For the sake of brevity and convenience of reference, these two hypotheses will be called "OM Chutes Favored" and "Scoring Generally Depressed," respectively. In turning to a consideration of the objective conditions of the experiment in an attempt to weigh these two possible explanations, one finds features which are consistent with each view.

From one point of view, it might be argued that, since there is no demonstrable statistical significance

about the results of the four series, it is in the interest of parsimony of hypotheses to regard that part of the data as wholly attributable to chance. This would be a logical argument for "OM Chutes Favored." On the other hand, it might be countered that, as long as one is testing ESP, he is entitled to take his hypothesis seriously; and that if the phenomenon has been demonstrated to hold for OM Chutes, it is legitimate to develop hypotheses about the form which it took in the other four procedures.

Mention was made in the introduction of a feature of the general experimental conditions which may be important for the present consideration. This is the fact that the testing was "routinized," by which is meant a definite number of runs per subject for each procedure and definite and fairly regular appointments for experimental sessions. The net effect of this upon the subject was to set a task for him--a task that was to be completed unless, of course, he wished to disregard the wishes of the experimenter. Each subject soon learned how many runs were expected of him, and from that point on there was presumably little spontaneity left to his later sessions. The experimenters often received the impression from the subjects that the completion of each run represented just that much less of a task remaining to be done. This was particularly evident when a procedure was disliked by the subject. As a consequence of the observation of the subject's reaction to the fixed quota aspect of the experiment, a strong impression of the futility of this method was formed by both experimenters in the course of the research. It is recognized that the small rewards offered were not sufficient to represent in themselves any strong offsetting factor. (There is no way of determining from the present evidence whether or not there was any effect on scoring ascribable to this feature.)

If this observation of an attitude indicative of a "task atmosphere" is correct, it would appear offhand that any effect on the scoring produced by it would be distributed equally over all five procedures. If this were the case, this factor might have caused the accentuation of negative-scoring tendencies which are supposed, by the "Scoring Generally Depressed" hypothesis, to have brought all the scores down to the chance level. But on closer examination there are features of the experiment which suggest that the OM Chutes test was completed before the "task atmosphere" could have become a factor in the experiment. This is suggested by the facts that the OM Chutes test came either first or second for almost all subjects; that when it did not occupy the first experimental session, that position was taken by GESP, such a

slow procedure that subjects never finished more than a fraction of their quota of runs in the first session; and that the OM Chutes was easily finished in a single session. This meant that OM Chutes was almost always the first test completed, and it is logical to suppose that it was only as a result of the subject's learning *that he had filled a quota in this test* that a "task atmosphere" developed. This attitude may therefore have been formed too late to affect the OM Chutes test. If this analysis is correct, the facts in question would seem to support the "OM Chutes Favored" hypothesis.

This survey of the features of the experiment which may be relevant to an explanation of why four of the five procedures gave insignificant deviations would not be complete without a reference to the differences among the testing procedures themselves. It was pointed out in the introduction that widely-different testing procedures were selected deliberately. This raises the question of whether the OM Chutes test may not have been the only one of the five upon which these particular subjects would have obtained significant results even if the procedures had been used singly in separate experiments. The following facts suggest the possibility of a positive answer to this question--an answer which would be in line with the "OM Chutes Favored" hypothesis.

The OM Chutes test was designed to provide all the special virtues of Open Matching without the sacrifice of scientific rigor of test conditions. The spontaneously-expressed preference which most subjects had for this procedure suggests strongly that the aim of developing a test well-suited to detecting ESP ability had been achieved. A list of the virtues of the OM Chutes test would itself be hypothetical, but in the judgment of the writers it would include (a) the simplicity of the set-up, (b) the handling of the cards by the subject, (c) the degree of spontaneity in manner of response allowed, (d) the directness of the task assigned--matching cards to visible key cards, and (e) the minimizing of rational factors and patterning tendencies by having the cards pass out of sight. The other four tests all fall short of the OM Chutes procedure in one or more of these respects.

On the other hand, some of the other procedures have features which strongly recommend them. GESP generally seems the most reasonable test to the beginning subject, and the highest scores ever obtained have resulted from this technique (11a). All of the other procedures in much their present form (except ESP Marbles) have yielded significant results in other experiments.

Nevertheless, it remains a distinct possibility that the differences in the techniques may explain, in part at least, the fact that only OM Chutes gave significant results.

The Negative Deviation. Significant negative deviations in ESP tests have been sufficiently common to receive considerable attention in the literature. In general, subjects who have been successful in getting high scores have been able to score below chance by adopting deliberately a "low aim." But there has been accumulated a great deal of evidence that, under some circumstances, subjects score below chance even when they are consciously trying to obtain a high average. Two general hypotheses of such unconscious negative scoring have been offered: one, that the subjects are somehow antagonized by some aspect of the testing situation, with the result that they are unconsciously *motivated* to violate the instructions of the experimenter and to use their ESP ability to *misname* the symbols; the second, that the subjects, without any contrary motivation, adopt a method of calling the symbols which is not favorable to giving expression to genuine ESP impressions--and *to the extent that they are exercising ESP ability*, the use of a wrong method of calling consistently misdirects the calling and results in below-chance scores. These various ways of accounting for low scores have been more fully discussed by Rhine in connection with the use of enclosed cards (9), precognition tests (7a), and the study of salience in ESP runs (in this issue).

It is clear, then, that there is no difficulty in conceiving how the subject, assuming that he is using an ESP ability in a test, could successfully avoid naming the symbols correctly. The only difficulty is in determining, either logically or experimentally, for each situation giving significant negative results, by which of the possible ways the low scoring was brought about.

In the present experiment, there are reasonably good grounds for dismissing the possibility that the subjects scored below chance in OM Chutes by deliberate low aim. They were instructed to score as high as possible, and their *desire* to do so was presumably further strengthened by the small rewards offered for high run scores. They showed by occasional spontaneous remarks that they were disappointed by low scores. In the opinion of the writers, there is no reason for suspecting that the subjects conspired, as this hypothesis would require, to try consciously to score below chance.

As far as the present possibilities of explanation are known, therefore, they consist of the two

hypotheses of *unconsciously* scoring low: "negativism" and "poor aim." The final choice of an explanation will have to await further experimentation, but we may nevertheless consider briefly how well each hypothesis fits the circumstances of the present experiment.

The fact that enclosed cards were used raises the question as to what results have been obtained with this condition in general. The most extensive enclosed card work is that of Rhine (9), but that particular work offers little explanation of the present problem. First, most of Rhine's work with enclosed cards gave positive deviations. He did find that when the tests were conducted with the subject to be kept in ignorance of his score for some hours, the results were only chance; and in correspondence tests using enclosed cards in which the subject naturally did not anticipate learning his scores for several days, there was, on the whole a significant negative deviation.

But in the OM Chutes work of this report, the subject learned his score within a very few minutes after the completion of his run--as promptly, perhaps, as in any of Rhine's work which gave positive results. So far, then, there is no agreement between the two. There is clearly no ground for supposing that the mere enclosing of the cards would normally explain the sub-chance trend of the scores. Superficially at least, there seems to be every reason for having anticipated averages above mean chance expectation. It would appear, therefore, that the negative result can not be attributed to the use of enclosed cards as such.

There is, however, one feature of similarity to the delayed reporting which proved to be a score-depressant condition in the work of Rhine just referred to; namely, in the OM Chutes procedure, the subject was not informed of his score immediately. Instead, he was asked to go on to another run while the experimenter checked the results of the run just completed. In other words, while he did not have to wait for hours or days as was the case in the earlier work, he did have to do each run except the first while presumably under the tension of anticipation as to how well he did in the just-preceding run. It is suggested that the negative scoring was caused by the feature of the procedure which forced the subject to make all his calls (except the first run) under the tension of wanting to know what success the experimenters were finding for the immediately-preceding run. Under these circumstances, it is reasonable to suppose that the subject's attention was divided between the checking-up process of the experimenters and his own

attempt to match the cards of another pack. If this were the important feature of the conditions, it is conceivable that the subject was irritated by being told to go ahead before he knew his score and that as a consequence he unconsciously exhibited negativism; but in the absence of any direct evidence of such a reaction, it seems more likely that the resulting cognitive state of the subject led to a consistent "poor aim." This poor aim would have resulted, for example, if ESP hits are made by seizing upon the first faint impression and if the distraction of attention by the checking procedure had caused the subject to reject first impressions in favor of other symbols. On those calls on which ESP would normally have given hits, he would thus be restricted in his choices to the four *wrong* symbols. The net effect would automatically be to get average scores below chance.

Another feature of the situation which may be important in trying to explain the negative scores is the peculiar social situation into which the subject was placed by the test procedure. The subject was usually not well acquainted with either of the experimenters at the time of this test. Frequently, he was making his first visit to the laboratory--or if not, his second. Being naive about ESP tests, he was naturally somewhat ill at ease and apprehensive. In this state of mind, he was shown the set-up and given the necessary simple instructions for taking the test. Then the experimenters disappeared into the closet and closed the door. The subject, while doing each run except the first one, could hear the experimenters handling the cards in the check-up and could hear, but not understand, whispered comments by which they carried on necessary communications. It is possible that this social situation brought about a condition in the subject which caused the negative scores. The supposed unfavorable attitude might have been a feeling of isolation or rejection, or an exaggerated self-consciousness caused by the subject's not being able to guage the experimenters' reactions to his performance in the tests. In any case, if the social situation were one of the effective factors in producing the negative scores, it seems likely that the *modus operandi* would have been unconscious negative motivation rather than cognitive poor aim.

A logical choice in favor of any one of the hypotheses discussed does not seem to be possible at the present time. Consequently, in any further experimentation along these lines it would appear to be necessary to take into account the various possible explanations here

presented, as well as any others consistent with the facts which might subsequently be offered.

Apart from all the highly speculative character of the discussion, however, there stands out the fact that by the criteria of the statistical world, there has been operative in the production of the results of this report the process which has been called "extra-sensory perception" (however curious the form it has taken); and it appears reasonable to add that even the peculiarities of its occurrence, its negative deviation under some conditions, and its failure to appear in either negative or positive deviation in others, all contribute bit by bit to the accumulation of knowledge which will eventually make it understandable.

VII. Summary

1. As a step toward the objective of correlating subjects' ESP scores with their ratings in various personality tests, 37 subjects were tested in five ESP procedures to the extent of 2,001 runs or 50,025 trials. This article reports only the experiments in ESP and leaves the correlation studies for a later report.

2. The 2,001 runs as a lump result have a deviation of 221 hits below mean chance expectation. This gives a critical ratio of 2.47, with the associated probability (for a deviation this large or larger in either direction) of .0136.

3. When the results as a whole are evaluated in a manner which has respect for the differences in the five test procedures (the method for the chi-square combination of critical ratios), a significant probability (.0045) is obtained.

4. Inspection of the results by procedures shows that one test condition, called OM Chutes, gave independently significant results. The results of this procedure consist of 490 runs with a deviation of 165 less than mean chance expectation. With a standard deviation of 44.27, this deviation gives a C.R. of 3.73, with a corrected probability of .001.

5. The experimental conditions for OM Chutes are assumed to have ruled out all possibility of sensory cues, of selection, or of recording and statistical errors as explanations of the results. Hence, the ESP hypothesis is offered as the most reasonable interpretation of the extra-chance results.

6. The possible reasons for the chance scoring in four out of five procedures and for the negative results in OM Chutes are discussed.

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October 28, 1941

To: Dr. Gardner Murphy
Subject: Review of "A Comparison of Five ESP Procedures," by Humphrey and Pratt.

This paper was read and criticized by Dr. E. R. Hilgard, Drs. Lillian Dick and Louis Long, and by the writer. Each of the reviewers found the procedure clear, the treatment of data according to familiar conventions, and made no special comments.

Saul B. Sells, Chairman
Board of Review
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Brooklyn College
Brooklyn, New York

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Editorial Comments

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Terminal Salience in ESP Performance
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The Statistics of Salience Ratios
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